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CONSTRUCTION AND EQUIPMENT

No. 80

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CONSTRUCTION PLANNING AND ECONOMICS

MINISTER ADVOCATES MORE MECHANIZED BUILDING TECHNIQUES

Moscow STROITEL'NAYA GAZETA in Russian 5 Sep 82 p 2

[Article by G. Karavayev, minister of USSR construction: "A High-Output Line"]

[Text] The advantages of conveyor technology in the production of prefabricated reinforced concrete compared to the stand and flow-unit technology cannot be doubted by anyone. Specialized enterprises for large-panel house construction today are making wide use of different mechanized devices, machines and conveyor lines. At plants of the USSR Ministry of Construction, 49 conveyor lines are in operation for the production of parts of large-panel houses--mostly panels of outside walls.

At the same time, panels of internal walls and floors and ceilings, comprising today about half of the total quantity of prefabricated structural elements of a house, are made as a rule according to stand technology in series-produced multicompartment clusters. This technology is manifestly inappropriate for present-day development of industrial house construction. Its defects have to include the high metal intensiveness of the equipment and a comparatively small removal of products from production areas, high labor intensiveness of the work, considerable energy intensiveness of production and others. Working conditions are unfavorable in cluster production: here you have a high level of noise and vibration and increased humidity and temperature.

At the same time existing foreign and domestic production experience attests to the possibility of replacing stand cluster production with semiconveyor or conveyor production.

At Kalinin Support-Demonstration House Construction Combine, an experimental installation was created where basic production parameters of the future cluster-conveyor line were checked and finalized. Here the experience of foreign firms and individual developments of domestic institutes were taken into consideration. It is important to note that one of the conditions in the creation of a line was maximum use of units and parts of series equipment, first of all stand cluster installations.

Our ministry assigned its special design-technology bureau of the construction industry the development of an essentially new technology for the making of flat items of large-panel house construction. Such a technology was created.

The new cluster conveyor line for the vertical forming of flat items for large-panel house construction was solved on the basis of a closed scheme. It includes the following production processes: preparation and feeding of a concrete mixture, forming of items, their heat treatment and also the preparation of the vertical trolley molds.

The production technology provides for the use of a progressive method of preliminary heating of the concrete mixture. In the first stage, a "dry" concrete mass is prepared in a forced-operation mixer of sand and crushed stone heated to 25-30°C. In the second stage, the "dry" concrete mixture is mixed with heated water in an SB-138 mixer directly at the molding post. With such a technology, the cycle of preparation of the mixture is significantly reduced, and its high mobility is retained.

The basic element of the line is a vertical trolley mold. It consists of a steam dividing compartment from a typical cluster installation on which there included edge equipment and all the aperture formers. The vertical trolley mold is intended for simultaneous making of two flat reinforced-concrete panels. The trolley with the aid of a modernized conveying cart is placed into one of the two established-in-parallel molding machines into which the hot concrete mixture is placed.

The molding machine consists of two extremely hot compartments from the usually series-produced installations with typical striking [raspalubochnoye] equipment. The trolley mold is set in the shaping machine on a special cart, which makes it possible for it to be moved on opening or closing of the shields in the required direction. Placing of the concrete into the compartments is done with a concrete placer, the capacity of whose hopper is calculated for the forming of the two products.

The heat compartment of the shaping machine and the trolley mold are heated prior to putting in of the concrete. The formed products are kept in the machine for 45-60 minutes at a temperature of 80-85°C until they become durable and can be transported with open surfaces. Then the trolley mold on the transmission cart is put into a tunnel chamber for further heat treatment, and the next one is put in its place.

After the second heat treatment, the trolley mold is taken by another cart, which brings it the station of the conveyor for striking with the aid of a bridge crane. After a certain curing, the items are transported to the finished product storage.

The operation of the cluster conveyor line involves the employment of separately standing panels with remote and semiautomatic control. For more distinct completion with appropriate items, the chart provides for a reserve park for the trolley molds. If according to the completion chart, the item is not required, the trolley mold after the striking is taken by the transmission cart and placed in such a "store."

This year, the first experimental cluster conveyor line became operational at the Kalinin House Construction Trust. It is planned for the production of 30,000 cubic meters of internal wall panels per year, which should provide for a supply of these items for houses with a total floorspace of 150,000 square meters. And now the line has reached its planned work regime of 6 moldings per shift.

The cluster conveyor line is very compact; for the fabrication of the same quantity of products, it requires only two-thirds of the production area. The metal intensiveness of the equipment at the same time is reduced 40 percent and the labor intensiveness of making the parts--35 percent. Capital investment is smaller by 15-20 percent.

The cluster conveyor production technology can be used also for making panels for floors and ceilings, products for open galleries, partitions and other flat elements. In a model unified span of 18 X 144 meters, standard for enterprises of the construction industry, it is possible to place four-five installations. This ensures the production of internal wall panels for 200,000-250,000 square meters of housing or internal walls and slabs for ceilings or floors for houses with a total area of 100,000-120,000 square meters with two-shift work.

Calculations carried out by special design and technology bureaus of the construction industry attest to the technical-economic feasibility of using cluster-conveyor technology for the production of flat reinforced-concrete panels both in new construction and in modernization, especially in connection with the reequipment of existing enterprises. In this instance, with the creation of the cluster-conveyor lines there can be used units and parts that were formerly employed at plants for cluster installations.

Taking into consideration the promising character of cluster-conveyor technology, the USSR Ministry of Construction outlined a broad program of reequipment of existing house construction combines. Such mechanized lines are expected to be created in the wake of Kalinin House Construction Combine at Ivanovo, Dushanbe, Cheboksary, Yaroslavl and other enterprises large-panel enterprises for house construction.

The introduction of cluster-conveyor technology will contribute to raising the effectiveness of industrial large-panel house construction and improving all technical-economic indicators of operation of large-panel enterprises for house construction. At the same time, production standards will be raised and working conditions will be improved.

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CONSTRUCTION PLANNING AND ECONOMICS

INVESTMENT IN CAPITAL CONSTRUCTION DISCUSSED

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian
No 3, 1982 (signed to press 4 Feb 82) pp 51-66

[Article by Candidate of Technical Sciences S. N. Bulgakov, chief of the USSR Gosplan department of construction and construction industry, and Candidate of Technical Sciences I. A. Zaikin, USSR Gosplan senior expert, Moscow: "Capital Construction in the Investment Complex"]

[Text] The end result of the investment process is expressed in the start-up of production capacities, which materialize the achievements of scientific and technical progress. The complex of investment or capital-formation branches, and capital construction as part of that, therefore occupy a pivotal position in the mechanism of socialist reproduction.

The construction complex includes: construction production, the leading element of the complex and the one determining the end results of its activity; the production of building materials and components; machinebuilding branches which supply specialized tools of labor.

Capital construction has become a most important means of revolutionizing transformations of social production, an accelerator of scientific and technical progress; it is precisely capital construction which has ensured the rapid development of the Bratsk and Ust'-Ilimsk LPK's [probably: lumber industry complexes], the mining and metallurgical base of the Kursk Iron Ore Complex, the petroleum and gas industry of Western Siberia, Sayano-Shushenskaya GES, Kurskaya AES and the Baykal-Amur Mainline.

Capital construction which actualizes capital investments represents a major branch of the national economy which creates material wealth which is part of the aggregate social product in the form of buildings, structures, enterprises, industrial complexes, transport arteries and other facilities. Although having many features in common with other branches of the national economy, it also possesses specific peculiarities which include, first of all, the following two: a temporally and spatially drawn-out process of creating commodity output (investment cycle length) and prolonged "consumption" of construction output, long-lived fixed assets elements. Improvements and innovations in production capacities being put into operation, the speed with which scientific and technical achievements spread to production, the time involved in utilizing new deposits, reducing unfinished construction and, in the end, the rates of expanded reproduction depend in decisive measure on the length of the investment cycle.

Capital Construction and the Capital-Formation Process

The scope and tempo of material production depend directly on the size of existing fixed assets and their technical level. Rapid growth in production fixed assets permits their accelerated up-dating by ensuring technical progress and increased social production efficiency.

From 1965 through 1980, fixed assets in the national economy increased more than 2.8-fold, with particularly high rates of growth in the leading investment branches of industry and construction (more than 1.8- and 3.8-fold, respectively, see Table 1). By late 1980, the amount of fixed assets in the national economy had reached 1.7 trillion rubles, including 1.1 trillion in production fixed assets, in current prices.

Table 1. Proportion of Capital Investments and Fixed Production Assets in Several Branches of USSR Industry, in percent

Branch	in capital investments			in fixed assets			
	1966-1970	1971-1975	1976 1979	1965	1970	1975	1980
electric power engineering	11.4	10.1	8.8	14.9	17.4	16.8	9.0
fuel industry	19.0	18.7	21.1	13.9	13.1	12.6	23.4
chemical and petrochemical industry	9.2	9.3	10.1	8.3	8.9	9.4	11.3
building materials industry	5.3	5.0	4.2	6.1	5.7	5.8	4.2
machinebuilding and metal-working	18.8	22.4	24.6	19.0	20.0	22.5	24.2

The methods of fixed assets expanded reproduction are of substantial importance in the investment process. The distribution of capital investments into new construction, renovation, expansion and retooling existing enterprises is an important indicator of the reproduction structure.

The relationship of the two methods of expanded reproduction of fixed assets changes appreciably (see Table 2, following page). Whereas the bulk (70 percent) of the investments in the prewar period were directed into new construction, by the start of the 11th Five-Year Plan the proportion of capital investments in expanding, renovating and retooling existing enterprises, among centralized capital investments, had increased more than two-fold.

Construction work on expanding an existing enterprise disrupts its normal production activity to a certain extent. It is therefore not surprising that enterprise leaders try to separate the expansion zone. As a result, there are production facilities with inefficient shop arrangements, long utility lines and uneconomical layouts. During renovation, the flexibility of construction organization and opportunities for comprehensive mechanization are restricted, delaying the productive use of equipment and extending facility installation schedules.

The advantage of new construction is that plans can use the latest achievements of engineering, technology and production organization. The construction of new enterprises creates conditions for their efficient siting, permiting the use of

Table 2. Proportion of Capital Investments in Renovating, Expanding and Retooling Existing Enterprises, Among Total State Capital Investments, By Branch of Industry, in percent

	1975	1976	1977	1978	1979	1980
electric power engineering	32	33	38	32	35	34
coal industry	78	81	77	74	78	77
ferrous metallurgy	73	75	82	81	80	80
chemical and petrochemical industry	63	63	65	64	64	66
machinebuilding and metalworking	71	74	76	77	79	80
building materials industry	64	66	67	69	73	74

new natural resources and the establishment of the most efficient ties among production facilities. Organizing construction production itself at a new project is distinguished by flexibility of forms and permits the possibility of comprehensively mechanizing a majority of the construction processes.

At the same time, new construction, and especially in little-utilized regions, is connected with preparing the industrial site, creating a developed system of transport networks and accesses, large water, gas and power supply utility lines, installing a cascade of auxiliary facilities, developing the nonproduction infrastructure, and selecting and training personnel. All this increases the cost of construction, so it is extremely important to reduce the construction cycle and accelerate capital investment turnover.

It would be incorrect to counterpoise new construction and renovation. They are two aspects of a unified process of fixed assets expanded reproduction. The economic appropriateness and effectiveness of one or the other of them plays the primary role in the choice of construction method.

The relationship between new construction and renovation exerts an appreciable influence on the technological structure of capital investments. The fact is that the proportion of construction-installation work is still high in new construction, while this indicator is 1.5- to two-fold lower for renovation. This naturally augments the role of the most active portion of investments in the fixed assets reproduction process. The growth in investments in renovation and retooling is associated with the necessity of rapidly replacing technological equipment in the course of technical progress in social production.

Continued reduction in the proportion of construction-installation work in the technological structure of capital investments has become an inseparable part of the long-range economic program. Whereas construction-installation work swallowed up 83 percent of all capital investments during the first five-year plan, and equipment 12 percent, the figures were 52 and 38 percent, respectively in 1980 (see Table 3, following page). The proportion of construction-installation work in the 10th Five-Year Plan was 55 percent of all capital investments, and the proportion of equipment -- 36 percent.

In other industrially developed countries, the proportion of equipment in investments is higher: 48 percent in England, 41 percent in France and 49 percent in the FRG. It should be remembered, however, that data on the technological structure of investments in the USSR and in capitalist countries are not

directly comparable, since expenditures on a significant portion of the technological units are recorded in construction-installation work (foundations under equipment, let's say) in domestic statistics.

Table 3. Technological Structure of Capital Investments, in percent of overall capital investment

	1940	1965	1970	1975	1980
construction-installation work	82	63	62	59	52
equipment, tools, inventory	13	30	30	33	38
planning-surveying work	2	1	2	2	2
other capital expenditures and work	3	6	6	6	8

The creation of large industrial complexes is a qualitatively new form of investment distribution; a strong flow of investments is being directed to regions in Siberia and the Far East. Although production complexes are also being created in the European portion of the USSR (such as the industrial complex based on natural resources of the Kursk Magnetic Anomaly), shifts in the distribution structure are obvious. The shift in capital investments to little-utilized and unutilized regions of the country has become a feature of modern regional investment policy.

The high demands on enclosure and load-bearing components, the features of installing footings and foundations and, finally, the scope of building modern and both territorially and socioeconomically relatively autonomous production complexes are causing substantial changes in construction technology and organization, increasing demands on means of labor, and changing procedures and conditions for their operation. Concepts of the unavoidable capital-intensiveness of construction in Siberia and the Far East have had a definite influence on shaping the "capital-intensive" concept and have found reflection in forecast capital-availability variants for construction organizations.

However, numerous examples prove that, in spite of the use of regional coefficients in Siberia and the Far East, the estimated cost of production facilities is no higher, in many instances, than that for analogous projects in the European portion of the country. The unitization and standardization of base models of construction equipment enable us to reduce to a minimum additional expenditures connected with design changes in machinery and equipment intended for operation in Siberia and the Far East. The net cost of fuel, raw and other materials being produced in Siberia and the Far East is generally significantly lower than in the central regions.

One characteristic feature of the 11th Five-Year Plan is that it anticipates outstripping growth in national economic end results as compared with capital investments. The planned increase in national income is to be ensured with a lower absolute and relative capital investment growth than in the preceding five years. This is why, as was noted in the report by Comrade N. A. Tikhonov at the 26th CPSU Congress, "we need to actualize even more energetically the directives of the party Central Committee and Leonid Il'ich Brezhnev's instructions on resolutely combatting the scattering of capital investments, on concentrating them on the most important sectors of industrial and agricultural production and start-up construction projects, on reducing new-project installation time."

One feature of the work of contractor ministries in the 11th Five-Year Plan is that efforts will be concentrated in regions of concentrated construction. High rates of construction-installation work are anticipated in regions of Siberia, the Far East and the country's north. Such territorial production complexes as the West-Siberia, Sayansk, Angara-Yenisey, Timano-Pecherskiy, South-Yakutsk, Pavlodar-Ekibastuz, South-Tajik and others will be developed. Completion of construction on the Baykal-Amur Mainline will be a turning point in the economic fate of this enormous region.

Construction Technology Progress

The accelerated introduction of scientific and technical achievements into production is a decisive condition of rapid development of the investment complex and the construction comprising it. The primary direction of scientific and technical progress in construction is its industrialization, which will ensure the transformation of construction into a mechanized process of assembling and installing buildings and structures made of factory-produced standardized elements; this will permit a sharp reduction in construction duration and a considerable reduction in its cost, automation of production processes, the introduction of effective building materials and items and greater factory finish, and the use of progressive forms and methods of organizing construction production.

The successes of construction industrialization have resulted from the increased prefabrication of buildings and structures being erected, thanks to the extensive use of industrially manufactured reinforced and ordinary concrete, metal, wood and other construction parts and components (see Table 4, following page). The use of prefabricated reinforced concrete components and parts has permitted a significant rise in the level of construction industrialization. However, they are being used dissimilarly in different branches of construction, which results from the modular-layout and structural features of buildings and structures. The level of building and structure prefabrication in rural construction is still comparatively low, although steadily rising.

The degree of construction production industrialization is characterized most accurately by the level of fully prefabricated construction. In the Lithuanian SSR, that level is higher than the union average, 49 percent in 1980; it reached 68 percent for the Latvian SSR Ministry of Construction in 1979 (as against 41.1 percent in 1970). The specific expenditure of concrete and reinforced concrete components is still low nationwide, slightly exceeding 1,520 m^3 per billion rubles of construction-installation work. In recent years, specific expenditures of concrete and reinforced concrete components has stabilized as a result of the partial replacement of reinforced concrete components by metal and glued wooden components in industrial construction.

The comprehensive mechanization and automation of production processes is emerging as a decisive factor of technical progress in construction. Machines and machinery play an ever-increasing role in construction, as is borne out by the amount of work done using them. During 1965-1978 alone, it increased more than 2.5-fold. The availability of machinery to construction production has been increased thanks to rapid expansion of the fleet of construction machinery and machines. In early 1980, construction was using 107,800 single-scoop excavators, 119,500 bulldozers, 39,800 mobile installation cranes, 34,400 scrapers and a large amount of other general-construction and special equipment.

Table 4. Production of Prefabricated Reinforced Concrete Components and Parts, Wall and Other Building Materials

Indicator	1960	1965	1970	1975	1979
prefabricated reinforced concrete components and parts, in millions of cubic meters	30.2	50.1	84.6	114.2	122.2
wall materials, in billion reference bricks		46.6	56.9	63.0	58.0
including: construction brick		36.6	43.2	47.0	41.8
linoleum, in million square meters		31.2	57.4	71.9	87.8
ceramic floor tile, in million square meters		15.3	19.5	23.7	23.2
glazed ceramic tile for inside facings of walls with irregularly-shaped parts, in million square meters		12.3	17.2	24.1	32.6

Systematic supplementation of the fleet of construction machinery and machines has enabled us to achieve high construction mechanization indicators (see Table 5). As we see, earthmoving work has the highest level of mechanization.

Table 5. Level of Mechanization of Basic Types of Construction Work in 1981, in percent of all work

Type of work	
Mechanization	
earthmoving work	99.5
plastering	74.7
painting	78.4
Comprehensive mechanization	
earthmoving work	98.0
installation of concrete and reinforced concrete components	97.1
concrete preparation	87.6
concreting and reinforced concreting	93.0

However, in spite of the high relative level of construction mechanization, significant amounts of construction are still being done by hand, which is especially typical of earthmoving work. Roofing and finishing work such as spackling and oil-painting surfaces are still insufficiently mechanized. The comprehensive mechanization of laying down rolled insulation has essentially just begun.

The most efficient method of construction production is flow-line construction, which enables us to work smoothly and ensure that construction processes are continuous. The construction flow is one of the key factors of industrialization and one without which the full use of the advantages of highly mechanized building and structure construction using standardized prefabricated components and parts is impossible. One of the primary directions of construction industrialization has been introduction of effective new construction components with a high level of factory finish. Prefabricated reinforced concrete and steel components will become the basis of prefabricated construction in the forthcoming decade.

The use of continuous columns reaching several stories, frame span components, thin-wall arch shells, long roof and span shabs, combination steel and reinforced concrete roofs and other effective components in whose manufacture high-strength reinforcing steel is used will be significantly expanded. We plan to increase the production and use in capital construction of such progressive components as steel and lightweight metal items for buildings supplied in sets, and also factory-coated corrosion-resistant components.

The use of bolted components made of high-strength steels and economical rolled metal sections will be expanded in 1981-1985, and the use of components and items made of lightweight alloys will be increased, production reaching 100,000 tons by 1985.

Glued wooden components will become more widely used, production increasing to 320,000 cubic meters by 1985. Such components are being used not only in the installation of agricultural facilities, but also in the construction of buildings for industrial enterprises, bridges, public buildings and facilities. Their use will permit a reduction in building weight and a significant savings in metal and cement.

The basic design features of construction machinery in the 11th Five-Year Plan will be increased power and lower weight.

The mobility of the excavator fleet will be increased by changing it over to tractor drive, expanding the number of replaceable parts and the extensive use of hydraulic drive systems.

We plan to increase the average power of single-scoop excavators being supplied construction by 11 percent in the 11th Five-Year Plan as against the 1980 level, of bulldozers by six percent, scrapers -- 10 percent, and tower and installation cranes -- an average of five percent. Deliveries of effective types of construction equipment will be increased, including self-propelled scrapers -- 70 percent and heavy-duty installation cranes and multiscoop excavators -- 16 percent. Moreover, construction will be receiving new types of machines -- automatic concrete pumps as part of cement mixers, conveyor-type concrete layers, hydraulic hammers, tractor-pulled cultivators in the 30-ton class, and 25- to 40-ton hydraulic cranes on special chasses.

We are faced with beginning the series production of equipment for building "wall-in-ground" installations, manufacturing drill-rammed piles, 200-ton installation cranes, sets of machines for laying roll roofing materials, and plastering centers. Painting stations equipped with multipurpose units for hydrostatic and hydrodynamic spraying of paint and spackling compounds, sets of machines for preparing, conveying and clean-finishing monolithic floors (including by vibration vacuuming) and for installing roll roofing and applying asphalt emulsions will be used extensively.

Labor Productivity of Construction Workers

Providing construction with workers remains one of the most complex problems. The party and government are paying this question the most serious attention. The party and government decree "On Steps to Further Improve the Training of

Skilled Personnel and Secure Them in Construction" adopted in January 1979 has had a positive effect on reducing turnover in construction.

The radical solution to the problem lies on the path of accelerating the rise in labor productivity among construction workers. Increasing the amounts of construction-installation work and the efficiency of construction production depends in decisive measure on this factor.

Since 1940, labor productivity in construction has increased more than 6.4-fold (see Table 6), and it has risen 72 percent relative to 1965. We must not fail to note, however, that the rates of labor productivity in the 10th Five-Year Plan lagged behind those planned due to shortcomings in labor organization at construction sites.

Table 6. Labor Productivity Growth in Construction (Excluding Repair-Construction Offices and Interfarm Construction Organizations) Per Worker in Construction-Installation Jobs and Auxiliary Production, in percent

years	in percent of 1940	years	in percent of 1940	in percent of 1970	in percent of preceding year
1950	125	1975	576	129	105.4
1955	125	1976	594	133	103.1
1960	285	1977	612	137	103.0
1965	367	1978	625	140	102.2
1970	448	1979	631	141	101.0
		1980	640	143	101.4

Thanks to systematic labor productivity growth, the number of workers employed per million rubles of construction-installation work is decreasing: it has decreased from 136 persons in 1965 to 73 in 1980. The proportion of expenditures on wages in expenditures on construction-installation work is also decreasing (see Table 7).

Table 7. Structure of Expenditures on Construction-Installation Work (Based on Actual Net Cost), in percent of all expenditures

	1940	1965	1970	1975	1980
materials	48.9	55.6	55.6	55.0	52.7
basic worker wage	20.9	16.5	15.2	14.3	14.1
expenditures on operating machines and machinery	2.5	8.3	9.5	10.3	11.4
other expenditures	6.1	3.8	3.5	4.1	4.4
overheads	21.6	15.8	16.2	16.3	17.4
including: administrative and managerial	9.3	5.3	5.7	5.1	5.6

In 1981-1985, particular attention is being paid to equipping construction organizations with efficient mechanized tools, fittings, inventory and high-quality hand tools for performing basic and auxiliary operations. Implementation of the measures planned will enable us to lower the proportion of manual labor per million rubles of construction-installation work by at least 20-25 percent and to raise the availability of power to labor 1.5-fold and availability of machinery

to labor 1.3-fold by the end of the five-year plan. This program will ensure a 15- to 17-percent rise in labor productivity in construction.

Perfecting the Planning and Management of Construction Production

Planning and forecasting capital construction is becoming an integral part of the investment process management system. The most important direction in improving the use of capital investments in the 11th Five-Year Plan will be a new approach to its planning. The allocation of capital investments for a planned increment in output will be its basic principle. This assumes, first of all, planning existing production andnew construction as a unified whole and, secondly, the priority of renovating and retooling the existing production apparatus on a base of the latest equipment and technology in distributing capital investments, material and labor resources, and equipment.

The indicators for planning and evaluating construction-installation organization activity are being substantially altered. Reliance is being placed on construction end results, as well as qualitative indicators which more fully describe the effectiveness of construction production.

Beginning in 1981, an overall amount of commodity construction output is being approved for ministries and departments, as well as construction-installation organizations. It is determined by the amount of construction-installation work on enterprises, lines, start-up complexes and projects ready to produce output or render services which have been released to clients. We plan a gradual changeover to planning labor productivity using normative nominal net output.

Construction ministries are faced in 1981 with completing development of general plans for managing construction. The goal is to consolidate construction-installation organizations, create production construction-installation associations, eliminate parallelism in the work of those organizations, continue deepening specialization and reduce the number of management links.

The changeover of union republic construction ministries, construction main administrations and other middle management link organizations to cost account will be completed in the 11th Five-Year Plan. The basis of their financial activity will be normatives of deductions from the profit remaining at their disposal, as well as economic incentives funds. Much work is being done to perfect construction management and concentrate construction-installation work in construction ministries provided with a well-developed industrial base.

The country's construction sites continue to introduce a new form of cost accounting, the brigade contract. Experience has shown that multipurpose cost-accounting brigades achieve a higher level of labor productivity than narrowly specialized brigades. This is to be explained, in particular, by the reduction in losses of working time due to technological work interruptions and organizational lack of coordination in multipurpose brigades. Multipurpose brigades do not exclude, but rather presuppose, link specialization and individual worker specialization within the brigade, which permits a more intelligent use of personnel in accordance with their skills.

Automated construction production control systems will be further developed and the development and introduction of an automated plan calculations system into

the construction complex will be completed. Work has begun on introducing an automated construction management system. Production plans are calculated, plans and schedules for delivering prefabricated reinforced concrete to customers are drawn up, operational information is processed and project construction PERT networks are refined using computers.

Construction is faced with becoming a highly specialized branch of industrial production which will occupy a worthy place in the country's investment complex.

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MACHINEBUILDING IN INVESTMENT PROCESS

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian
No 3, 1982 (signed to press 4 Feb 82) pp 66-84

[Article by Candidate of Economic Sciences G. Ya. Kurbatova, machinebuilding sector chief at the Institute of Industrial Production Economics and Organization of the Siberian Division of the USSR Academy of Sciences at Novosibirsk: "Machinebuilding in the Investment Process"]

[Text] The task of intensifying and increasing the effectiveness of social production presupposes a developed program of retooling all spheres of economic activity. Growth in the technical level of the production apparatus requires major investments, and first of all a strong flow of tools of labor -- machinery, equipment, devices, and so on. In the investment complex, machinebuilding and metalworking account for approximately half of the gross output, number of production personnel and capital investment volume, and this share will tend to continue growing as we change over to an intensive type of reproduction.

The place and role of machinebuilding industry are determined first of all by their capital-formation function. Increasing the amount of fixed assets and improving their technical and economic quality serve as the material basis for developing and perfecting all social production.

Machinebuilding Industry and Capital Formation

Since 1960, fixed assets in the national economy have increased four-fold, including a 5.5-fold increase in industrial production fixed assets.

It is known that the level of equipment available to labor, its productivity and the potential of branches for producing output are determined by the active portion of fixed assets: power and operating machinery and equipment, measuring and regulating devices and installations. This portion has increased 6.4-fold since 1960, that is, the rates of growth in the active portion of fixed assets, by branch of industry (with the exception of electric power engineering), have only slightly exceeded the rates of growth in fixed industrial-production assets. As a result, the proportion of power and operating machinery, equipment and means of transport in the fixed assets structure does not exceed 39-40 percent.[1] The share of measuring and regulating devices and installations is small:

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[1]According to CEMA member-nation statistical annual data (Moscow, Izd-vo "Statistika", 1976), the share of this portion was 50,5 percent in the GDR and 40.6 percent in the Czechoslovak SSR in 1975.

it varied from 0.75 in 1960 to 1.4 in 1980 for industry as a whole. The share of this type of assets which, to a certain extent, determines the level of production automation, does not exceed one percent (with the exception of machinebuilding and metalworking, where the proportion was 2.6 percent in 1980).

Along with quantitative growth in the active portion of fixed assets, the qualitative composition is also changing, being constantly updated. Thus, during 1966-1979, some 17,205 obsolete machinery, equipment, apparatus and instrument designs were withdrawn from production, 7,255 during the first four years of the 10th Five-Year Plan alone.[1]

There exist two methods of updating fixed assets, adding new means of labor to the available fleet and replacing obsolete and discontinued items with new ones. The first method has heretofore predominated in the national economy, that is, assets were reproduced primarily by increasing stocks, and the proper attention was not paid to replacing discontinued items. In investment deliveries, 82-88 percent of the equipment has been directed into increasing stocks and only 12-18 percent into replacement. In industry, the share of equipment going for replacement was 19.5 percent in 1966 and about 25 percent in 1975.[2] As a result, existing equipment has not been replaced with newer and more productive items with the onset of both obsoleteness and obsolescence, but has instead been repeatedly rebuilt through 3-4 or sometimes even more major overhauls. But according to calculations by the specialists,[3] a savings is achieved in comparison with the acquisition of new equipment only for the first major overhaul, and for subsequent overhauls the effectiveness of using old equipment steadily drops. This method of reproducing fixed assets has over time become one cause of their aging and of the lowering of rates of industrial production growth, of retardation of technical progress.

Slow updating of the equipment fleet has led in a number of branches to the accumulation of backward equipment. Thus, more than half the rolling mills in ferrous metallurgy are now obsolete, nonmechanized units in whose operation labor productivity is tens of times lower than on new units. New mills are providing only 45 percent of our rolled metal. And, according to calculations by specialists, the replacement of just one tenth of the mills with modern new ones would provide an additional roughly 14 million tons of rolled metal.

Similar examples could also be given for other branches. It has become necessary to raise domestic machinebuilding to a fundamentally new level.

Modern Domestic Machinebuilding

USSR machinebuilding and metalworking industry has been developed steadily. Branch gross output increased 33.7-fold from 1950 through 1980. The national economy now has available to it a multibranch machinebuilding industry which comprises 28.7 percent of all industrial production.

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[1]the statistical annual "Narodnoye khozyaystvo SSSR v 1979 g." [USSR National Economy in 1979], Moscow Izd-vo "Statistika", 1980, p 114.

[2]V. K. Fal'tsman, "Potrebnost' v sredstvakh proizvodstva" [Demand for Means of Production], Moscow, Izd-vo "Mysl'", 1975.

[3]D. M. Palterovich, "On Service Life and Updating Industrial Equipment" in VOPROSY EKONOMIKI, No 2, 1970, pp 67-68.

Major qualitative shifts are occurring in domestic machinebuilding. During the 1961-1980 period, its structure changed substantially. First, the proportion of branches ensuring technical progress, the mechanization and automation of production processes increased. They include tool building, machine tool manufacture, the production of chemical equipment, road-construction and municipal-services machinebuilding. Second, the importance of branches which ultimately determine the material well-being of the workers and satisfaction of their cultural and personal needs increased. They include automotive industry, the production of equipment for light, food, timber, pulp-paper and wood processing industry.

Along with this, there has been a slight reduction in the proportion of such branches as heavy, power and transport machinebuilding, electrical engineering industry, tractor and agricultural machinebuilding. Changes in the branch structure of machinebuilding as a whole should be considered progressive and oriented towards intensifying and increasing the effectiveness of production, although the dynamics of the changes are as yet inadequate.

In spite of major successes, the technical-economic level of machinebuilding industry is inadequate, fails to meet the tasks of retooling production, and does not ensure high rates of economic development. The November (1978) CPSU Central Committee Plenum pointed out that machinebuilding lags behind the requirements of the national economy. This thought was also expressed at the 26th CPSU Congress.

The dynamics of the rates of increment in machinebuilding and metalworking output during 1966-1980 testify to their systematic reduction. Whereas the rates of annual increment in output remained steadily at the 12.4-percent level during the Seventh Five-Year Plan, the average annual rate of machinebuilding development was 11.7 percent during the Eighth; it had dropped to 11.6 percent during the Ninth and fell to 8.2 percent during the 10th.

This reduction in tempo was expressed in a diminished role for machinebuilding in industrial production as a whole. The outstripping production of machinebuilding output as compared with industrial production as a whole began decreasing. Thus, whereas the ratio of their rates of increment was 2.0 : 1 in the prewar years, it had dropped to 1.43 in 1959-1960, to 1.20 in 1961-1966, to 1.16 in 1966-1970, to 1.20 in 1971-1975 and to 1.19 in 1976-1980. And if consideration is given to the distorting influence of repeated recording of material expenditures and the price factor, the actual rates of increment in machinebuilding and metalworking output turn out to be close to the rates of all industrial output and the rates of release of finished machinery and equipment are even lower. Thus, the average annual rates of increment in gross machinebuilding output were about 12 percent in 1966-1975, but the rates of increment in the production of machinery and equipment were 8-9 percent.[1] As a result, the requirements of the national economy for equipment were not being met.

[1]VOPROSY EKONOMIKI, No 1, 1978, p 33.

Machinebuilding and the Needs of the National Economy

The necessity of outstripping production of tools of labor while observing efficient proportions between machinebuilding, on the one hand, and industry and construction, on the other, dictates the special role of machinebuilding in the national economy.

However, the dynamics of the relationship of the branches are such that by the late 1960's, not only had the outstripping delivery of equipment deliveries decreased, but they had even begun lagging behind industrial production. Neither were there outstripping deliveries of equipment relative to construction. In the Ninth Five-Year Plan, the situation changed somewhat. Deliveries of machinery and equipment relative to growth in industry and construction increased, and the ratio of their rates reached 1.05 and 1.08 to 1.0, respectively. However, this ratio cannot radically improve the technological structure of capital investments and ensure the creation of a technical base for the national economy which will meet modern demands. The growth in the release of tools of labor lags substantially behind the needs of consumer branches. The lack of conformity of the production of needed equipment, apparatus and installations to the demand for them retards the resolution, for example, of the urgent task of reducing manual labor.

While exerting a substantial influence on reproduction of the aggregate social product, the machinebuilding branches themselves depend on this process. This dependence is expressed in the production consumption of output of other branches. A disproportion has evolved between the amounts and rates of development of machinebuilding and metalworking, on the one hand, and those branches of industry which provide machinebuilding with objects of labor, on the other.

This applies first of all to ferrous metallurgy as the primary supplier of materials for machinebuilding and metalworking. Machinebuilding and metalworking industry consume two-fifths of all rolled ferrous metals. The low and lowering rates of growth in ferrous metallurgy therefore cannot but have an effect on the development of machinebuilding as well. Moreover, the assortment and quality of the ferrous metals being released by domestic metallurgy do not fully meet the demands of machinebuilding, which also retards its progress and limits the effectiveness of production.

This situation is to be explained in considerable measure by the imbalance between ferrous metallurgy and machinebuilding, and foremost metallurgical machinebuilding, whose level does not correspond at all to the tasks of retooling metallurgical production. The fact is that there is practically no specialized metallurgical machinebuilding in the national economy today. It is represented primarily by broadly specialized plants which manufacture an extended range of other equipment, in addition to metallurgical equipment, for dozens of branches of production.

The share of investments in metallurgical machinebuilding relative to the total capital investment in ferrous metallurgy is low and has tended to decrease in recent five-year plans. If consideration is also given to the fact that the branch must provide equipment both for nonferrous metallurgy and to meet export deliveries, the proportion of capital investments in the production of machinery and units for ferrous metallurgy turns out to be even lower.

Available metallurgical machinebuilding production capacities cannot ensure the development of progressive new technological processes in metallurgical industry. The reference is foremost to teeming steel using continuous-casting machines (MNLS). The amount of steel cast using MNLS's reached 16.6 million tons in our country in 1980, that is, 11.2 percent of all steel smelted (40-50 percent of the steel produced in Japan, the FRG and Italy was smelted using MNLS's in 1979). The country which first developed and mastered this progressive technology today does not occupy the leading position in terms of amount of continuously-cast steel.

One of the primary reasons for the lag in machinebuilding is the shortage of capital investments. Although it concentrates about one-third of the country's industrial potential, the branch's porportion of capital investments in industry was 18.8 percent in 1966-1970, 22.4 percent in 1971-1975 and rose to 24.6 percent only during 1976-1980.

Intensifying and improving the efficiency of social production and equipping the spheres of economic activity with highly productive equipment require changes in the national economic and branch proportions of production and in output distribution. The reference is foremost to the outstripping development of the production and delivery of equipment to retool machinebuilding and metalworking and the complex of branches producing structural materials.

The leading role of machinebuilding industry in retooling the national economy presupposes a powerful and progressive technical base first of all for machinebuilding itself.

The Technical Base of Machinebuilding and Metalworking

The production assets of machinebuilding and metalworking industry increased 4.5-fold from 1961 through 1980. As a result, the share of this branch in total industry production assets rose from 18.6 to 21.5 percent (from 15.6 to 18.7 percent for machinebuilding proper).

The growth in machinebuilding fixed assets was accompanied by qualitative change in their composition due to the receipt of highly productive machine tools, automatic and semiautomatic machines, automated and flow lines. The number of mechanized flow lines installed just during the past 14 years increased from 9,862 in 1965 to 40,260 in 1979, that is, more than four-fold, and the number of automated lines increased from 2,965 to 12,912, or 4.3-fold. However, many types of machines and equipment are still not being produced in our country; individual types of machines are being supplied, but not equipment complexes provided with transport and loading-unloading systems and means of automation. As a result, quantitative growth in the scattered, although highly productive machinery and equipment being used in production has not yet created conditions for the comprehensive mechanization and automation of technological processes in machinebuilding and is therefore not distinguished by high economic effectiveness.

Qualitative change in machinebuilding production fixed assets depends first of all on the status and growth of such branches as machine-tool manufacture and electrical engineering industry, instrument-making, lift-transport machinebuilding, machinery and equipment repair, bearing industry and, in part, metallurgical

machinebuilding. During 1966-1975, the production assets of these branches increased approximately three-fold (3.6-fold for tool making). However, the proportion of their fixed assets in machinebuilding is low. Thus, it was 6.3 percent for electrical engineering industry in 1975 and 4.9 percent for machine-tool and tool-making. But the share of each of these leading branches in overall production fixed assets of industry does not exceed two percent.

The dynamics of the technological structure of machinebuilding and metalworking fixed production assets are characterized by in increase in the proportion of machinery and equipment. During 1966-1980, their share rose from 35.3 to 46.3 percent. The greatest increase in the proportion of active assets was observed in electrical engineering industry (from 42.5 to 49.0 percent), in chemical and petrochemical machinebuilding (from 38.0 to 43.1 percent) and tool making (from 42.0 to 48.9 percent), and in construction and road machinebuilding (from 25.0 to 42.3 percent). In other branches of machinebuilding, the share of active assets fell slightly.

The dynamics of the availability of capital to labor testify to the growth in the availability of equipment to production in machinebuilding and metalworking. During 1965-1980, overall capital availability in the branch increased 2.7-fold, including the availability of active assets (machinery) to labor -- 2.8-fold.

As compared with other branches of industry, machinebuilding demonstrates a more favorable dynamic of return on capital, which has tended to grow, rather than decrease, in this branch. Thus, during 1961-1975, it increased nearly 30 percent. The outstripping growth in availability of machinery (over overall availability of capital) has resulted to a certain extent from the superiority (by 30 points) of the rates of labor productivity growth as compared with its availability of capital.

The above bears out that domestic machinebuilding has available to it an enormous production-technical potential. However, the special role of machinebuilding industry requires continued improvement in its technical base.

Retooling the Branch. As is known, metalworking equipment, the fleet of which is comparatively young in our country, comprises the basis of the machinebuilding production apparatus. However, the share of machine tools and forging-pressing machines which have been in operation less than 10 years has been steadily decreasing. The fact is that the overwhelming majority of annual receipts of metalworking equipment go to increasing the fleet, while the annual level of discontinuance remains at the level of the mid-1950's.

The intensive updating factor, which reflects the internal ties between accumulation and updating of means of labor, is lower in domestic machinebuilding than for industry as a whole and is tending to decrease. It was 0.20 in 1975, as against 0.25 in 1966 (this factor was 0.29 on average for industry in 1975). The share of annual equipment replacement in the overall machinebuilding and metalworking industry fleet did not exceed 3.0 percent in 1966-1975 (except for 1972, when the equipment replacement norm for the branch equalled 3.23), which is clearly inadequate for production intensification. In the opinion of ENIMS [Experimental Scientific Research Institute of Machine Tools] specialists, the level of annual metalworking equipment replacement must be at least 6-8 percent.

True, the equipment replacement norm for individual branches of machinebuilding is substantially higher than the industry-average indicator. Thus, it was 5.1 percent for tool making in 1975, 5.15 percent for machinebuilding for light and food industry, 5.96 percent for construction-road machinebuilding and 7.52 percent for machine-tool industry.

However, inasmuch as equipment replacement is not done comprehensively at enterprises, that is, individual machine tools or pieces of equipment are replaced rather than entire technological lines, replacement does not yield the necessary impact. Moreover, individual branches of machinebuilding, and especially of heavy machinebuilding such as metallurgical and lift-transport, discontinue less than one percent of their old equipment annually.

Obsolete equipment and machinery is therefore operating in industry alongside modern units representing the latest achievements of science and engineering. On the one hand, they divert a significant portion of the personnel, leading to poorer use of new equipment and, consequently, to substantial losses in fleet productivity, lower labor productivity, increased materials-intensiveness and poorer output quality. On the other hand, they cause overexpenditures of funds for major overhaul.

Consequently, given the slow growth in the release of machinery and equipment and the high rates of growth in the available fleet of machinery and equipment, opportunities for replacing equipment steadily decrease and service life grows. Machinebuilding's opportunities for ensuring rapid replacement are already very limited. It must be remembered that the demand for replacement is increasing 3.5-fold faster than resources. Thus, given decreasing rates of release of machine tools,[1] only 50-60 percent of the demand for machine-tool fleet replacement can be met, even if all incoming machine tools are directed into replacing obsolete ones.[2] And in fact, about 30 percent of the incoming machine tools are now being allocated for these purposes, that is, 15-20 percent of the annual demand. At the same time, metalworking equipment comprises the bulk of the machinery fleet, and its prompt updating determines the effectiveness of social production. Specialists calculate that we should now be producing 2.0- to 2.5-fold more of this equipment.

Structure of the Metalworking Equipment Fleet and Its Level of Use. The failure of the opportunities of the technical base of machinebuilding and metalworking to conform to modern production demands is also manifested in the unfavorable structure of the metalworking equipment fleet and its level of use.

The share of forging-pressing machinery in the total metalworking equipment fleet is only about 16 percent. At the same time, based on the experience of the industrially developed countries, an efficient ratio of forging-pressing equipment to machine tools would be 1:3. However, the metalworking equipment production structure which has evolved is poorly oriented towards improving proportions in

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[1]The average annual rates of increment in machine tool production were 8.9 percent in 1966-1970, 8.8 percent in 1971-1975 and 6.3 percent in 1976-1979.

[2]Yu. M. Ivanov, "Proportions of Expanded Reproduction During Intensification," in "Problemy narodnokhozyaystvennogo optimuma" [Problems of the National Economic Optimum], Novosibirsk, Izd-vo "Nauka", 1980, p 234.

the existing equipment fleet. The proportion of progressive forging-pressing machinery being produced, although gradually increasing, still does not exceed 21-22 percent. The lack of modern forging-pressing machinery and the predominance of free-forging equipment at machinebuilding plants results in extensive scrap metal, as much as 27 percent of the metal consumed (more than 15 million tons).

Machinebuilding enterprises have too few progressive types of technological equipment: 38 percent of the machine tools are designed for rough-finishing parts[1] and only 11.3 percent are high-precision machine tools; the share of precision equipment, automatic equipment, and especially of numerical preset control equipment is small. And the machine tool production structure still cannot substantially facilitate improving the existing equipment fleet in domestic machinebuilding. The share of progressive groups of machine tools (specialized, special, unitized, grinding, rough-grinding and equipment for electrophysical and electrochemical technologies), which ensure a high level of labor productivity, remains low, although it is tending to increase. As a result, only 25 percent of the assembly operations in machinebuilding have been mechanized and about five percent have been automated.

Ways of Intensifying Machinebuilding and Increasing Its Efficiency

In order to resolve the socioeconomic tasks set by the 26th Party Congress, outstripping growth in the release of tools of labor as compared with the release of means of production to retool branches of machinebuilding and metalworking is needed. We are consequently faced with the task of eliminating disproportions in the development of machinebuilding and related branches, lacking which it will be impossible to ensure high rates of expanded reproduction, rapid labor productivity growth, and the comprehensive mechanization and automation of production processes in the national economy.

In view of the limited capital resources, it is efficient to change the branch distribution of capital investments in favor of the following directions, for example.

1. Improving the structure of metal output and its quality, mastering the production of special, economical rolled-metal shapes to meet machinebuilding needs. Modernizing existing production and organizing the production of new and highly productive metallurgical equipment, and the accelerated development of the fourth redivision of metallurgical industry.

2. Accelerating scientific-technical progress in machinebuilding itself to improve its technical base, including:

-- developing and improving the technical base of machine-tool manufacturing;

-- creating and developing a specialized, concentrated procurement base and facilities to produce items for general machinebuilding application;

-- developing the centralized production of lift-transport machines and machinery;

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[1]Such a machine tool fleet structure results from the structure and quality of the structural materials (high tolerances), as well as from the poor development of specialized interbranch production facilities.

-- ensuring high rates of development of tool-making and means of automation;

-- specializing and concentrating repair and spare-parts production.

Renovating, expanding and retooling existing production must become the dominant direction of capital investments in machinebuilding. Major new construction is evidently justified only to actualize fundamentally new technical resolutions and organizational forms of production which go beyond the framework of the opportunities for retooling the existing production apparatus and shifting certain types of production to new regions, the eastern regions in particular.

To improve the technical base of the national economy and more intensively update the production apparatus, we should first of all ensure the outstripping development of machinebuilding itself, improvement in its branch structure, and better quality, reliability and durability of the machinery and equipment being produced. In order to increase the role of machinebuilding and metalworking in industry, we are faced with making substantial progressive changes in inter- and intrabranch proportions.

We should first achieve progressive proportions between the rates of growth in machinebuilding output, on the one hand, and the rates of all industry and construction, on the other. Accelerating the updating of the production apparatus, which is associated with the rapid obsolescence of equipment and technology, and mechanizing and subsequently automating the branches of material production will significantly broaden the demand for highly productive machinery and equipment. It is calculated that the rates of increment in equipment production must exceed the rates of industrial growth approximately 1.5- to 1.6-fold by 1990 in order to retool the national economy and meet the needs of the sphere of nonmaterial production. Otherwise, given retention of the existing relationships and rates of production of equipment, industrial output and construction-installation work, we will not only fail to accelerate the renewal of the equipment fleet, but will even be forced to reconcile ourselves to retardation of that renewal.

Second, we are faced with actualizing efficient proportions between the development of machinebuilding and branches providing it with basic types of objects of labor and services. The intensification of machinebuilding requires the development of branches providing it with resources: capital construction; improving the quality and assortment of structural materials; retooling and developing the technical base of scientific research organizations and experimental production facilities to broaden the research work front and reduce the time involved in developing and introducing new models of machinery and equipment into production.

Further, we need to achieve effective relationships in the development of individual branches of machinebuilding and metalworking which provide means and objects of labor, the machinebuilding complex itself, on the one hand, and nonmachinebuilding branches of the national economy, on the other. The time has come for fundamental shifts in the structure of machinebuilding production, and foremost for a sharp rise in the proportion of metallurgical machinebuilding output and the output of general machinebuilding branches (machine-tool manufacture, electrical engineering, bearing industry, tool-making, interbranch

production facilities, and lift-transport machinebuilding). The share of these branches, which determine the technical base of machinebuilding production, must evidently be raised to the 28-30 percent level.

Major advances cay be achieved only by increasing machinebuilding mobility, which is necessary when mastering new types of equipment and new models of machinery. We should therefore anticipate reserve production capacities which will enable machinebuilding branches to restructure their work flexibly.

Improvement in proportions between fixed assets expansion and renewal in accordance with plans for developing social production in the long-range interests of its normal activity and maneuverability is insistently demanded. The forced replacement of obsolete equipment, given lower rates of fleet increment, must become the primary method of updating the active assets of machinebuilding in the next 15-20 years. According to calculations by scientific research organizations, 35-40 percent of future equipment production should be directed towards replacing discontinued equipment (instead of the 20 percent today).

The nature of equipment distribution should obviously be changed in order to accelerate scientific-technical progress in machinebuilding itself, to intensify and increase the effectiveness of its production: deliveries of new metalworking equipment to machinebuilding ministries should be significantly increased. After major overhauls, equipment formerly in operation at machinebuilding enterprises can be transferred to nonmachinebuilding production facilities.

Conducting a unified policy and coordinating the technical development of machinebuilding industry and the entire complex of materials-producing branches, and especially ferrous metallurgy, deserve special attention. The reference is to raising the overall level of metallurgy, expanding the assortment of metal products and improving their quality, and also mastering the production of special, economical rolled metal sections. At the same time, we must be concerned about creating and increasing the release of modern, highly efficient machines and reliable automated complexes of metallurgical equipment.

Progress in metal production should be closely linked to the needs of metalworking. The country needs metal products intended to be machined in a maximal approximation of the shape and dimensions of finished parts with a minimum number of operations. Along with modifying traditional methods (precision casting, cold and semihot drop forging, cold and hot extrusion and others), the efforts of technologists have been aimed at developing and experimentally working out fundamentally new technologies: electrotechnical and electroerosion stamping, electron-ray (including laser) stamping, high-energy stamping, ultrasonics, vacuum-working, new types of welding, soldering and gluing.

Disseminating new machining methods and accelerating the updating of the technical base of machinebuilding assume an increase in deliveries of progressive tools and equipment. Quantitative, qualitative and structural changes require expansion of production capacities, and foremost the preferential development of machine-tool manufacturing. Machine-tool manufacturing's share of gross machinebuilding output (excluding interbranch production facilities) must, by preliminary calculations, be increased by at least 2.7 to 3.0 percent for expanded reproduction of active production fixed assets and for making up complete sets of them in machinebuilding itself.

Intensifying parts and technological specialization in machinebuilding presupposes radical reorganization of the interbranch and auxiliary production complex through changes in the organizational structure of machinebuilding plants -- dividing technological, servicing and auxiliary shops into independent production units and achieving optimum production scale. It would obviously make sense to delineate a specialized branch by combining enterprises of a single specialty within a department empowered to develop and conduct a unified technical policy, to centralize capital investments for the production of output for general machinebuilding application. According to preliminary calculations, even partial parts specialization would provide an opportunity to quickly double the release of many types of output and free up to 40 percent of the auxiliary workers for other tasks.

However, the creation and development of a reliable procurement and interbranch base is a complex matter which takes time. Specialists in machine-tool manufacturing[1] therefore propose that the first stage should probably be a kind of inventorying of projects already completed, as well as of shops and plants in this specialty in operation or under construction. We could choose from among them those whose installation or renovation is nearing completion and concentrate there the funds, materials and equipment for putting them into operation as quickly as possible. And it would make sense to do this even through investments in other branches of machinebuilding, first of all in mechanical assembly production facilities thus far operating at less than full capacity (due to a lack of the needed amount of blanks).

One major reserve for increasing the effectiveness of social production in the long term might be to heighten the role of foreign economic ties. It would first of all make sense, for example, to increase the proportion of machine-tool manufacturing output in imports for the expanded reproduction of technological equipment at domestic enterprises. It seems efficient to expand purchases of assembly components for machine-tool manufacturing (electrical-hydraulic-pneumatic apparatus, bearings, preset-control systems, and so on) and other subassemblies. This would enable us to gain time and to save labor and material resources necessary to organizing and developing their own production.

At the same time, it would be intelligent to reduce the share of exports of metalworking, metallurgical and lift-transport equipment in the next 10 years. It could be directed into updating and expanding the fleet of equipment in the country's national economy.

This review of the tasks facing domestic machinebuilding shows that their successful resolution can be ensured only by comprehensively planning and integrating the development of material production, scientific-technical and planning resolutions, the experimental-design and semiindustrial base, and training and retraining personnel. In the long term, we are faced with working through a list of central problems and developing an optimum strategy for resolving them.

In order to more precisely study and resolve its top-priority tasks, machinebuilding should be approached as a complex multibranch complex with a relatively

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[1]PRAVDA, 16 June 1976.

independent internal logic of development. A hypothetical structure of the machinebuilding complex assumes, in our view, the delineation of three parts which carry equal functional loads:

1 — machinebuilding complex nucleus: production of tools of labor which determine technical progress in machinebuilding (tool-making, means of automation, machine-tool manufacturing);

2 — production of objects of labor and general-purpose means of production for machinebuilding (electrical-engineering industry, lift-transport machinebuilding, interbranch production facility, bearings production, and so on);

3 — final stages of machinebuilding production: release of specialized tools of labor for other branches of the national economy.

Each predecessor of the three levels of the machinebuilding complex receives anticipatory development and serves following levels as the material condition of their development and operation. This representation of the machinebuilding complex can be made the basis of forecasts and calculations of the presupposed rates and proportions of development of USSR machinebuilding and metalworking industry.

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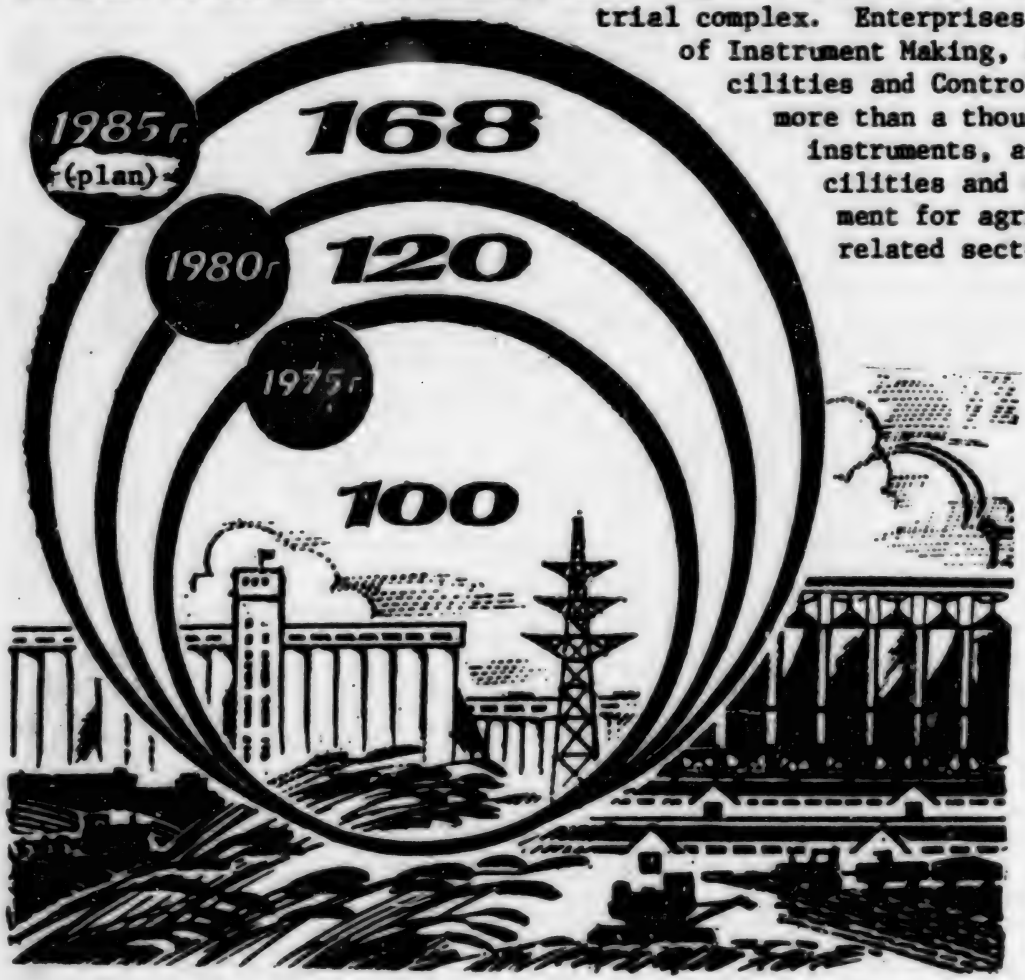
MINISTER SHKABARDNYA SPEAKS ON AUTOMATION IN AGROINDUSTRIAL COMPLEX

Moscow EKONOMICHESKAYA GAZETA in Russian No 37, Sep 82 pp 1-2

[Interview with M. S. Shkabardnya, USSR minister of instrument making, automation facilities and control systems: "USSR Food Program: Instrument Making for the Agroindustrial Complex. On the Basis of Large-Scale Automation"; dat·· and place not specified]

[Text] Instrument making is justifiably considered a catalyst of technical progress in the national economy, including in the sectors of the agroindustrial complex. Enterprises of the Ministry of Instrument Making, Automation Facilities and Control Systems make more than a thousand items of instruments, automation facilities and computer equipment for agriculture and related sectors.



Shipments of goods are increasing, and the product list is expanding. The chart given here shows that the production of instruments and automation facilities targeted for rural areas is increasing at a rapid pace. The creative efforts of 70 large research

organizations of the Ministry of Instrument Making, Automation Facilities and Control Systems [Minpribor] are concentrated on developing new models of this kind of equipment. The current Five-Year Plan calls for developing and organizing production of more than 200 new instruments and automation facilities, and more than 120 automated control systems for the agroindustrial complex.

In the course of realization of the Food Program approved by the May (1982) Plenary Session of the CPSU Central Committee, collaboration is being further developed between workers in instrument making and sectors of the agroindustrial complex.

During the Eleventh Five-Year Plan the production of high-efficiency computer technology, and the latest equipment for automation of technological processes, quality control of goods and remote control facilities is being developed for all sectors of the national economy.

[Question] Workers in all sectors of the national economy are making efforts to contribute to implementation of the USSR Food Program approved by the May (1982) Plenary Session of the CPSU Central Committee. Would you tell us, Mikhail Sergeyevich, about the part played by enterprises and organizations of the instrument making sector in realization of this program?

[Answer] Our sector is not directly a part of the agroindustrial complex. However, in working in close contact with those employed in food production, instrument makers take an active part in carrying out this most important national economic undertaking. For example, more than 130 industrial associations and enterprises of Minpribor are supplying more than a thousand items of instrumentation and automation facilities to the agroindustrial complex. During the last five-year plan the volume of shipments to agriculture and related sectors was in excess of 500 million rubles.

Let me name just some of our goods made for the agroindustrial complex: instruments and equipment for continuous lines used in analyzing soils, feed and plants; a computerized system for local automation of hothouses; remote-control complexes for management of land reclamation processes; facilities for diagnosis of agricultural machines without disassembly; automation facilities for livestock breeders, poultry farms, and flour mills; weighing equipment.

During the Eleventh Five-Year Plan the volume of shipments for agricultural production will more than double. There will be an appreciable improvement in the technical level of instruments, machines and equipment. More than 70 scientific and design organizations and enterprises will produce new equipment for rural areas.

Industrial associations -- Moscow "Manometr", "Leningrad Electric Machine Plant", Cheboksary "Prompribor", L'vov "Mikropribor" and many others — are doing well in meeting obligations for shipments of goods to the agroindustrial complex.

At the same time, there are those that need to catch up: the Kazan production association "Teplokontrol'", Tomsk Manometer Plant, and the Krasnodar plant

"Tenzopribor". These are now lagging on some items of the product list quota. The ministry keeps a close watch on orders of the agroindustrial complex.

Recent years have seen increased development of work in the field of automated control systems, which will no doubt be conducive to intensification of agricultural production. The current five-year plan calls for developing and making operational more than 120 automated control systems of various designations in sectors of the agroindustrial complex.

In July the ministry in conjunction with the Central Committee of the trade union of machine builders and with the participation of certain ministries that are part of the agroindustrial complex held an extended board meeting specifying the main directions of work and steps to implement the resolutions of the May (1982) Plenary Session of the CPSU Central Committee.

[Question] Instrument making is rightfully considered the catalyst of technical progress. What are the main directions on which the ministry is now concentrating its efforts?

[Answer] Obviously we should consider the major jobs to be those whose results may have a considerable effect on intensifying production, and that are conducive to improving production efficiency both on the scale of the national economy as a whole and in our sector itself. If it comes to far-reaching problems of the near future, I would single out four directions: development and introduction of automated process control systems; development of microelectronics and microprocessor equipment for production control; development and introduction of robotics (industrial robots, manipulators, robotic complexes); development of automated design systems.

In the final analysis, as you can see, it all boils down to the major factor of intensification — retooling industry on the basis of large-sacle automation. After all, the goal is to raise the technical level of production, the quality and reliability of goods produced. At the same time, the way is opening up for moving on to technology without people, reduction of manual labor. It is the solution of these problems that is provided for in the retooling program that has been worked out in the sector and is being put into practice right now.

Minpribor is taking an active part in carrying out a program of developmental work on automating machines, equipment and instruments with the use of microprocessor facilities and using this as a base for setting up automated production units. In particular, our ministry has been charged with the responsibility for the technical level and support of production of controlling computer complexes.

Microelectronics is opening up fundamentally new vistas for highly effective automation of production, design and planning in all sectors of the national economy. During the last five-year plan, instrument makers tripled the volume of output of items based on microelectronics. The fraction of such instrument production and computer equipment reached 38 percent in 1980. In 1985 it will exceed 60 percent in the total production volume.

We consider robotization to be a major component in the comprehensive program of mechanization and automation. Experience accumulated in the sector bears witness that large-scale use of robots increases labor productivity by an average of 1½-2 times.

The goal program worked out by the ministry for 1982-1986 calls for developing and introducing into enterprises of the sector more than 30,000 robots, manipulators and robot complexes. As of now, only isolated plants have robots and manipulators (mainly in the watchmaking indsutry); in 1983 there will be more than 4,000, and by 1986 they will have been introduced in nearly all enterprises of the sector.

Particular attention in the sector is being given to development of automated design systems in machine building. Systems of this kind embody enormous potential capabilities for accelerating scientific-technical progress.

A direction of some importance in the work of our scientific, design and installation organizations is tied up with automated control systems, and particularly process control. During the current five-year plan, Minpribor organizations are to develop and introduce about 400 automated process control systems in various sectors, which will save about 100 million rubles.

[Question] What will be the effect of production automation, considering all its aspects, on development of instrument making itself, on the use of available reserves?

[Answer] There are already more than a hundred automated process control systems in our sector. In particular, introduction of an automated process control system at the L'vov "Mikropribor" Plant has saved in excess of a million rubles.

Extensive mechanization and automation of production in our sector with the use of robotics and automated process control systems gives the capability of saving labor about 45,000 rubles according to preliminary calculations.

Instrument makers have at their disposal adequate reserves to meet assigned quotas established for 1983-1985 without increasing the staff of industrial production personnel. And this is the goal formulated in the socialist competition; it is the main content of the anniversary celebration plan of enterprises and of the entire sector.

We met the quota for last year ahead of schedule. Production volume rose by 6 percent over 1980, and labor productivity increased by 7 percent. The same pace of increase in production volume and labor productivity (with respect to the index of normative net output) has been maintained for the eight months of the current year. A considerable amount of goods in excess of the plan has been produced. The quota for sales with consideration of delivery obligations has been 99 percent fulfilled.

[Question] Work experience of many enterprises confirms effectiveness of the team form of labor organization. What is being done in this direction in instrument making?

[Answer] The team form of labor organization has already become basic in some enterprises. These include in particular the production associations "Prompribor" in Orel and "Tochelektropribor" in Kiev.

When it comes to the sector as a whole, over the last three years the fraction of workers unified into teams has increased from 18 to 63 percent. In this connection, more than 80 percent of the team members are being paid with respect to final results.

Last spring the ministry in conjunction with the Central Committee of the trade union held a seminar of representatives of team leaders' councils. Questions discussed to great advantage at this seminar included organization and standardization of labor, improvement of cost accounting, efficient use of working time, socialist competition, material and moral incentives and others.

It must be said that the seminar also helped to reveal derelictions in this work. In some enterprises the changeover to the team form of labor organization has not been backed up by the necessary restructuring of production organization, the accounting system and labor standardization. Insufficient attention is being given to these problems at the Vilnius Electric Measuring Equipment Plant, at the Penza "Zarya" Production Association, and at the Kharkov and Yaroslavl "Orgtekhnika" plants.

[Question] Minpribor occupies a leading place among the machine building ministries with respect to production of consumer goods. Would you tell our readers what new items will be showing up on store counters in the near future?

[Answer] More than a quarter of the production volume in the sector is devoted to consumer goods.

Obviously it would be difficult to enumerate all the new products that we are producing. Therefore I will restrict myself to some of the latest things. The Ryazan "SAM" Plant this year is producing the first batch of mechanical portable typewriters. The "Schetmash" Plant in Kursk is starting production of an electric portable typewriter to be started in series production next year. This same plant has begun production of a complex mechanical "Railroad" toy. In all, more than forty plants are providing items of technical creativity and children's toys of a wide variety.

Because of the great demand for alarm clocks, production of these items will be considerably expanded, and in 1983 will exceed 18 million with a wider choice and diversity of appearance.

[Question] Rationalization of the sector management system is one of the conditions of intensifying production. What is being done in this direction?

[Answer] Actually since the earliest days of formation of the ministry there has been a continuous process of improvement in sector management. Conversion of subsectors, and later of the entire sector to cost accounting principles of management, planning and financing in combination with the "ASU-pribor"

automated management system has given encouraging results on the whole. Of course, not everything has turned out as we might have wished, certain difficulties have to be overcome.

The decree of the CPSU Central Committee and the USSR Council of Ministers dating from 12 July 1979 defined the main directions of further improvement in the business machinery. All associations and enterprises are now using the NChP index [expansion not known] for planning and evaluation of activity; design organizations and some installing organizations have been converted to estimates for completed items; economically sound standards have been set for working capital; plant specification sheets have been compiled; A changeover has been made to a normative method of distributing profit of the first group of associations and enterprises; about half the plants have gone to direct long-term relations.

However, we must not fail to note as stated at the November (1981) Plenary Session of the CPSU Central Committee that these steps on improving business machinery are being implemented slowly as a whole.

It would seem that the potential capabilities for improvement of planning and business machinery have not yet been fully discovered. A great deal depends here on the sector ministries that should be given broader independence while at the same time expanding the rights of associations and enterprises. And still of decisive significance in our opinion will be the restructuring of work of planning and supply agencies based on new requirements. We need to achieve complete balance of five-year and annual plans. In this we see a great reserve for effective action of the entire business mechanism.

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